HWRF Efforts and Collaboration with HFIP in the DTC

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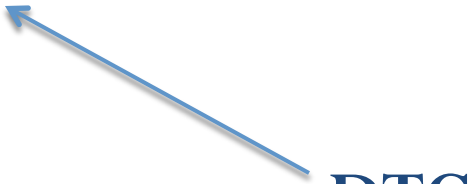
NOAA HFIP Goals

- Reduce average track error by 50% for Days 1 through 5.
- Reduce average intensity error by 50% for Days 1 through 5.
- Increase the probability of detection (POD) for rapid intensity change to 90% at Day 1 decreasing linearly to 60% at Day 5.
- Decrease the false alarm ratio (FAR) for rapid intensity change to 10% for Day 1 increasing linearly to 30% at Day 5.
- Extend the lead time for hurricane forecasts out to Day 7.

How are we going to do that?

Ingredients for Improvement

- Research and development
  - Model Improvement
    - Physical parameterizations, ocean and wave coupling, resolution, vortex initialization etc.
  - Observations
    - New and innovative observations for the storm and its environment
  - Data assimilation and model initialization
    - Optimal use of available in-situ and remote sensing observations
  - Ensemble
    - Probabilistic forecast, data assimilation (enKF), multiple-model ensemble
- Hurricane forecast improvements rely on EMC and NHC
- Mechanism to transition R&D to operations



DTC Goals on hurricanes

Current focus : HWRF

- Facilitate transfer of research to operations by creating a framework for NCEP and the research community to collaborate
- Support the community in using HWRF (the current NCEP operational hurricane model)
- Develop and maintain a hurricane testing and evaluation infrastructure at DTC
- Perform HWRF tests to assure integrity of code and evaluate new developments for potential operational implementation

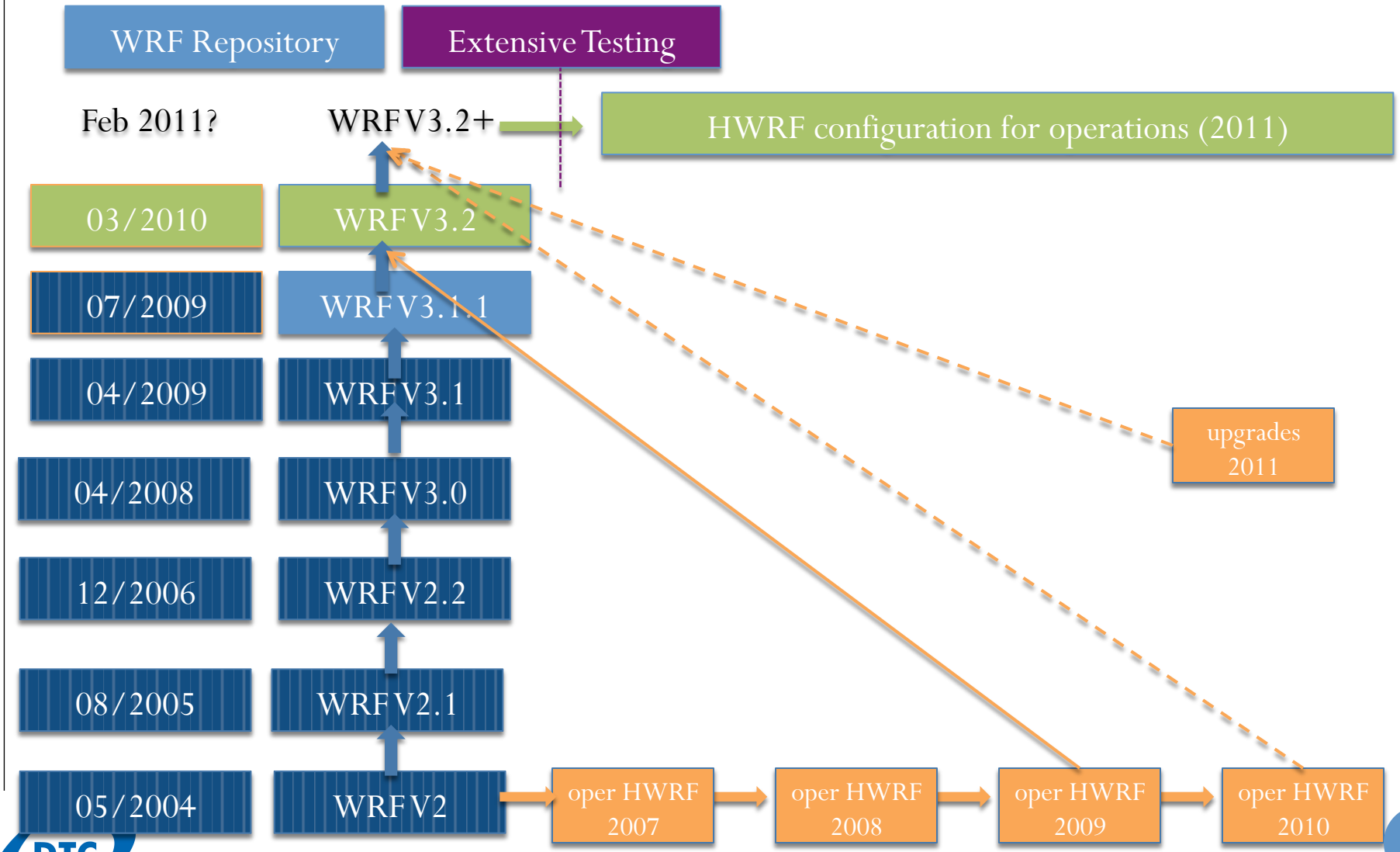
HWRF Code Management Agreement

Established between DTC and EMC in 2009

- Goal: NCEP and community use same code base for atmospheric component of WRF
- Accomplished O2R: DTC and EMC worked together to port HWRF features to WRF repository in 2009 (in V3.2 release)
- Upcoming O2R: Additional features of operational model (e.g., 2010 upgrades) will be ported to community repository and tested in 2010.
- Upcoming R2O: Community HWRF transitioned for operations at EMC in 2011

HWRF code management:

a new mechanism to facilitate collaboration between research and operations



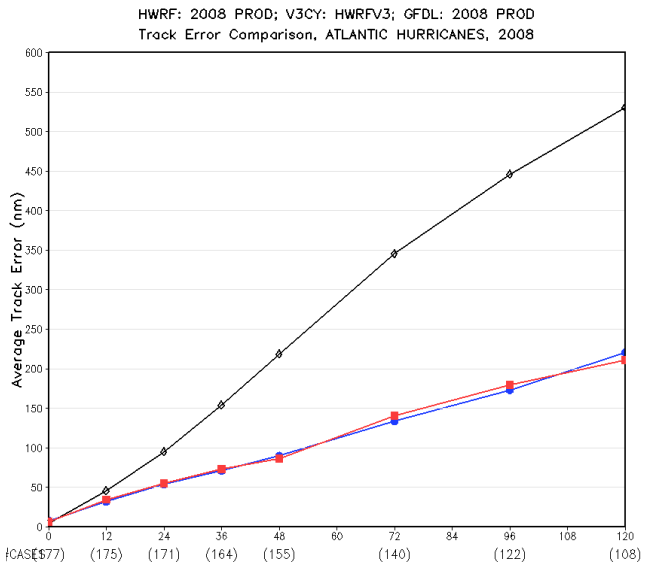
DTC Testing

- Purposes
  - Asses integrity of repository code as it evolves
  - Assist NCEP with pre-implementation testing
  - Evaluate skill of new developments funded by HFIP
- Protocol
  - Code to be tested must be in community repository
  - Preferably test official release code

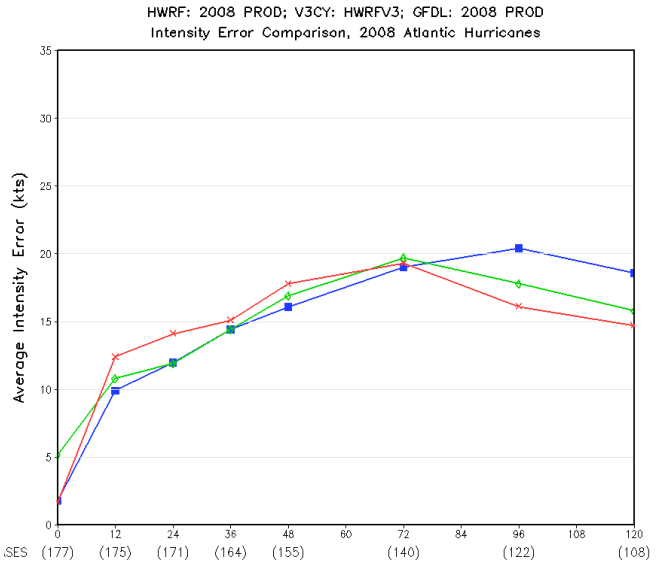
Hurricane Testing & Evaluation at DTC

- Testing environment functionally equivalent to NCEP's
- End-to-end cycled coupled HWRF runs
- Currently using HFIP Linux Cluster njet
- National Hurricane Center forecast verification system
- Additional verification metrics developed at DTC / HFIP

Testing results: 177 cases



- V2 with GSI; V3 without GSI
- V2 and V3 make "similar" track forecast
- Remaining differences in intensity
- Full assessment of V3 skill still needed



BLUE - operational model

RED - community WRF model code, after HWRF capabilities were added

GREEN - GFDL

BLACK – CLIPPER5 statistical model

Community Support of HWRF

- In March 2010, DTC started supporting HWRF to the community
  - WRF V3.2 release has HWRF features
  - Princeton Ocean Model
  - Vortex Initialization
  - Coupler
  - Vortex Tracker
- February 2010 Tutorial
- Documentation, website, helpdesk, code management

Future Work and Challenges

- Work with EMC to implement community HWRF (from the general WRF repository) for NCEP operation in 2011
- Establish functionally equivalent pre-implementation testing environment (parallel to EMC) for HWRF at DTC
- Work with HFIP to evaluate promising new development (from Stream 1) for possible operational implementation at NCEP

Outlook

- Expand beyond HWRF onto other needs
  - Ensemble prediction
  - EnKF data assimilation
  - Global models for hurricane prediction
- Develop new tools for evaluation of hurricane forecasting (have HFIP funding)
- Possible collaboration with JHT: DTC supports code management and T&E